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springing from the same point, although one is directed backward and sidewise in such a manner as to give the appearance of the short lateral cilium that has hitherto figured in the descriptions of this and some other genera of biflagellate Archimycetes. They are distinctly diplanetic and show a pulsating vacuole during the interval between the two periods of activity. Soon after infection the young parasites are lost to view in the host protoplasm, but retain their individuality and develop into zoosporangia without fusing to form plasmodia.

The parasite becomes coenocytic by nuclear division on the beginning of growth. The nuclei, which show the complete concentration of the chromatin into the karyosome characteristic of most chytridiaceous nuclei, appear to divide exclusively by mitosis of a type not very dissimilar from that of *Synchytrium*, but no astral bodies were seen. The chromosomes are approximately six in number. Segmentation is believed to be simultaneous, and begins at least before the sporangium enters the period of rest which it often undergoes before sporulation. The formation of resting spores was found to be dependent on conditions in the culture which are described. The small adjacent cells are definitely shown to be antheridia and the transfer of their coenocytic protoplasm to that of the egg is figured. The number of nuclei of the gametes unfortunately is not stated, but one would judge from the figures that it approximates 100. The fate of the male pronuclei after entering the egg could not be definitely followed, but it is believed that they fuse in pairs with the female pronuclei. The author concludes that "these forms seem to be primitive sexual organisms of the oomycete type. The influence of external conditions on the development of the sexual stage, the mode of fertilization, the unequal size of the two gametes, and the apparent morphological equivalence of these gametes with the sporangia, seem to the writer to point to that assumption."—ROBERT F. GRIGGS.

**An epiphytic *Tillandsia*.**—The "ball moss," *Tillandsia recurvata*, is found growing epiphytically upon many tree species in the vicinity of Austin, Texas, in such abundance as to be detrimental to its host. BIRGE<sup>17</sup> has found that any damage resulting to the supporting tree must be due to interference with the light supply, as the short holdfast roots merely furnish mechanical support for the moss, the water and salts necessary for the life of the plant being absorbed exclusively by the scale-covered leaves. A sufficient amount may be obtained from three hours dew or rain to last the plant for 38 hours. The leaves are well supplied with chlorophyll in minute oblong plastids, and the complete independence of the plant is shown not only by the entire absence of any organic connection with the living tissues of the host, but also by the fact that it thrives upon old board fences and even upon electric wire insulators. It seems to thrive best in semi-arid conditions. Shade trees may be freed from the epiphyte by scraping off the larger plants before the dissemination of

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<sup>17</sup> BIRGE, WILLIE I., The anatomy and some biological aspects of the "ball moss," *Tillandsia recurvata* L. Univ. Texas Bull. 194. pp. 24. pls. 10. 1911.

the seed in January, and by the destruction of the seedlings by spraying with a 10 per cent kerosene emulsion.

The study of the morphology of the reproductive organs shows a single archesporial cell giving rise to a parietal cell, which BILLINGS says does not appear in *T. usneoides*. In four or five days after formation the megaspore mother cell begins the divisions that result in a linear tetrad; an embryo sac of the usual type is produced; double fertilization commonly occurs, and the endosperm develops as free nuclei which eventually line the sac and become separated by walls. The development of the embryo is of the usual *Alisma* or *Sagittaria* type characteristic of most monocotyledons. The dispersal of the seeds is facilitated by long barbed hairs arising from the integument, and later functioning in attaching the seeds to the substratum, upon which they speedily germinate. Under favorable conditions germination frequently occurs within the capsule before the dispersal of the seed.—GEO. D. FULLER.

**Permeability.**— Heretofore the power of various anilin dyes to stain living plant cells has been tested on algae, water plants, root hairs, or thin sections of organs of land plants, a method introduced by the pioneer work of PFEFFER. KÜSTER<sup>18</sup> conceived that surface cells as used in this method may have different permeability characters from the deeper placed ones, also that cells of land plants may have their permeability characters considerably altered by sectioning. In order to test the ability of anilin dyes to penetrate the deeper lying cells in their natural conditions, KÜSTER used twigs of some size, or at least whole leaves with petioles. The cut ends were placed in aqueous solutions of the dyes, which were carried up the xylem by the transpiration stream, and, after 24 hours sections of the organs were studied for staining of the living cells along the xylem strands. A number of anilin dyes that former workers have pronounced incapable of entering living cells KÜSTER finds by this method to be excellent *intravital* stains. He distinguishes carefully between true *intravital* staining and staining due to injured protoplasm. In many cases cells were not injured by many days' treatment with dyes, and dyes abundantly stored in living cells were not reduced in amount by several days' washing in running water.

His results furnish much evidence against OVERTON's lipid theory of permeability; and in contrast to the results of RUHLAND on plant cells and HÖBER on animal cells, show, with few exceptions, a general parallelism between high diffusibility (non-colloidal) of the aqueous solution of anilin dyes and their ability to penetrate the living cell.—WILLIAM CROCKER.

**Chemical unit-characters in maize.**—While all inherited characters are probably referable to chemical relations brought about in the segregations and recombinations of the substance and substances of the germ cells, little atten-

<sup>18</sup> KÜSTER, ERNST, Über die Aufnahme von Anilinfarben in lebende Pflanzenzellen. Jahrb. Wiss. Bot. 50: 261-288. 1911.